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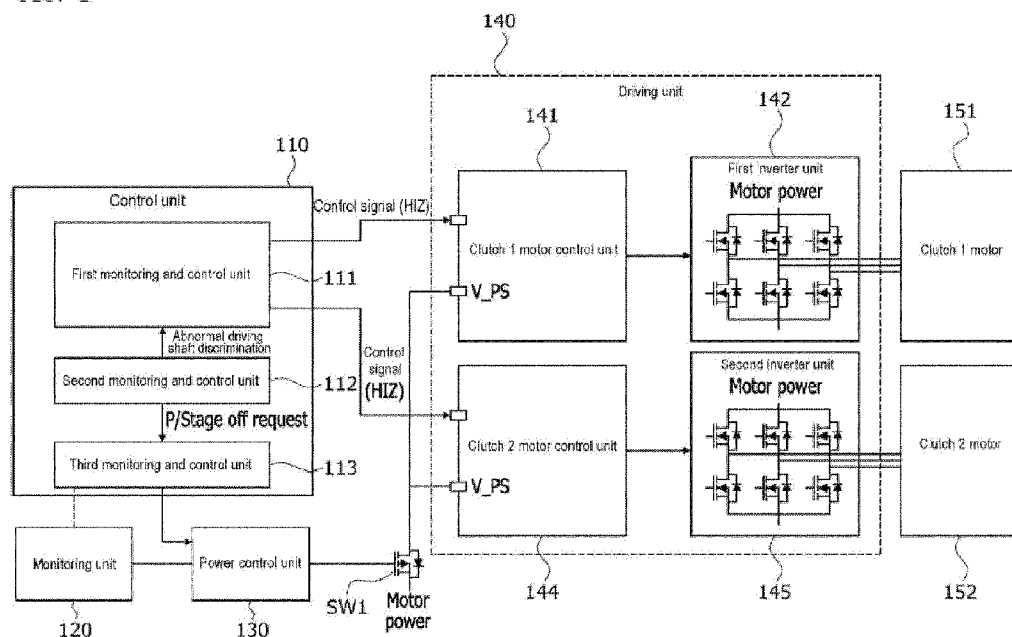
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(54) Title: SAFETY MODE CONTROL APPARATUS AND METHOD FOR DUAL CLUTCH TRANSMISSION IN VEHICLE

FIG. 1



(57) Abstract: The present invention relates to an apparatus and method for controlling a safety mode of a dual clutch transmission. The apparatus for controlling a safety mode of a clutch transmission is characterized by including: a control unit including a first monitoring and control unit processing a function related to a shift to interrupt a corresponding gear of a dual clutch transmission, a second monitoring and control unit checking signals input into and output from the first monitoring and control unit to determine an erroneous corresponding gear of the dual clutch transmission and cut off power or a motor control unit of a corresponding gear side, and a third monitoring and control unit monitoring whether an environment in which the second monitoring and control unit operates is normal to selectively cut off power of a corresponding gear or the motor control unit of a corresponding gear side if there is an abnormality; a power control unit driven by a control signal for selectively cutting off the power of the corresponding gear, which is

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output from the control unit, and the motor control unit of the corresponding gear side to cut off power applied to the motor control unit of a driving unit that drives the dual clutch transmission; and a driving unit driving an actuator that interrupts the corresponding gear with a gear shift level and shift feeling according to the control of the control unit.

SAFETY MODE CONTROL APPARATUS AND METHOD FOR DUAL CLUTCH
TRANSMISSION IN VEHICLE

FIELD OF INVENTION

5

The present invention relates to an apparatus and method for controlling a safety mode of a dual clutch transmission, and more particularly, to an apparatus and method for controlling a safety mode of a dual clutch transmission, which detect whether a malfunction occurs in a gear or a clutch in the dual clutch transmission so as to be converted into a safety state.

BACKGROUND OF INVENTION

15 Generally, a vehicle is provided with a transmission for adjusting a running speed. The transmission includes a manual transmission in which a driver manually adjusts the speed, an automatic transmission that is adjusted according to the running speed of the vehicle, and a continuously variable transmission which adjusts a speed by a combination of a pair of pulleys and a belt.

The dual clutch transmission according to this embodiment is a transmission system that is constituted by two clutches, unlike the conventional single plate clutch transmission system, in which a first clutch and a second clutch are capable of respectively interrupting an odd-numbered gear and an even-numbered gear and has an advantage in that it is easy to be driven as the automatic transmission and also has a fuel economy improvement effect higher than that of the manual transmission vehicle.

Also, the dual clutch transmission is advantageous in that the gear feeling is also excellent because there is no acceleration stop feeling generated in the single plate clutch.

There is a problem in such a vehicle transmission that when a malfunction occurs in the gear or the clutch, the malfunctioning

component causes the vehicle to be unable to be driven or the driver to be dangerous.

Thus, for preventing and solving the above-described problems,
5 in order to maintain a safety level in consideration of the dangerous situation expected by the malfunction, technologies for detecting the dangerous situation at all times and converting the vehicle to a safe state in consideration of the malfunctioning clutch or gear are needed.

10 The background art of the present invention is disclosed in Registered Korean Patent No. 10-0828601 (registered on May 02, 2008, METHOD OF CONTROLLING SAFETY MODE OF CONTINUOUSLY VARIABLE TRANSMISSION VEHICLE).

15 DESCRIPTION

According to an aspect of the present invention, which invention has been made to solve the above problems, an object of the present
20 invention is to provide an apparatus and method for controlling a safety mode of a dual clutch transmission, which detect whether a malfunction occurs in a gear or a clutch in the dual clutch transmission so as to be converted into a safety state.

25 An apparatus for controlling a safety mode of a clutch transmission according to an aspect of the present invention is characterized by including: a control unit including a first monitoring and control unit processing a function related to a shift to interrupt a corresponding gear of a dual clutch
30 transmission, a second monitoring and control unit checking signals input into and output from the first monitoring and control unit to determine an erroneous corresponding gear of the dual clutch transmission and cut off power or a motor control unit of a corresponding gear side, and a third monitoring and control
35 unit monitoring whether an environment in which the second monitoring and control unit operates is normal to selectively cut off power of a corresponding gear or the motor control unit of a corresponding gear side if there is an abnormality; a power control unit driven by a control signal for selectively cutting

off the power of the corresponding gear, which is output from the control unit, and the motor control unit of the corresponding gear side to cut off power applied to the motor control unit of a driving unit that drives the dual clutch transmission; and a
5 driving unit driving an actuator that interrupts the corresponding gear with a gear shift level and shift feeling according to the control of the control unit.

In the present invention, the dual clutch transmission may
10 include an even-numbered gear and an odd-numbered gear, and the second monitoring and control unit may check the erroneous corresponding gear of the even-numbered gear and the odd-numbered gear when an error of the first monitoring and control unit is detected to selectively cut off the power applied to the
15 corresponding gear side or the motor control unit of the corresponding gear side.

In the present invention, the third monitoring and control unit may monitor whether a power state, a sensor state, and states of
20 peripheral devices as environments in which the second monitoring and control unit is operable are normal.

In the present invention, the apparatus may further include a monitoring unit monitoring a state of the control unit, wherein,
25 when a previously designated signal is not output from the control unit, it may be determined that an error occurs in the control unit itself to allow the monitoring unit to cut off all power applied to the driving unit through the power control unit.

In the present invention, the driving unit may include an inverter unit for driving the motor in three phases when the actuator for a corresponding gear shift of the dual clutch transmission is a motor, the second monitoring and control unit may detect an operation signal of the inverter unit to compare whether the
35 detected operation signal of the inverter unit is an operation signal corresponding to a shift instruction actually instructed by the first monitoring and control unit, and when the detected operation signal of the inverter unit does not correspond to the operation signal corresponding to the actually instructed shift

instruction, the power of the corresponding gear that performs an operation that does not correspond to the shift instruction or the the motor control unit of the corresponding gear side may be selectively cut off.

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A method for controlling a safety mode of a dual clutch transmission according to another aspect of the present invention is characterized by including steps of: allowing a first monitoring and control unit to process a function related to a shift of a control unit and to interrupt a corresponding gear of the dual clutch transmission; allowing a second monitoring and control unit of the control unit to check signals input into and output from the first monitoring and control unit and to determine the erroneous corresponding gear of the dual clutch transmission and cut off the power or the motor control unit of the corresponding gear side; allowing a third monitoring and control unit of the control unit to monitor whether environments in which the second monitoring and control unit is operable are normal and to selectively cut off the power of the corresponding gear or the motor control unit of the corresponding gear side if there is an abnormality; and allowing a power control unit to cut off power applied to the motor control unit of the driving unit that drives the dual clutch transmission through a control signal for selectively cutting off the power of the corresponding gear, which is output from the control unit, or the motor control unit of the corresponding gear side.

In the present invention, in the step of allowing the second monitoring and control unit to determine the erroneous corresponding gear of the dual clutch transmission and cut off the power or the motor control unit of the corresponding gear side, the second monitoring and control unit may check the erroneous corresponding gear of the even-numbered gear and the odd-numbered gear of the dual clutch transmission when an error of the first monitoring and control unit is detected and to selectively cut off the power applied to the corresponding gear side or the motor control unit of the corresponding gear side.

In the present invention, in the step of allowing the third monitoring and control unit to monitor whether the environment in which the second monitoring and control unit is operable is normal, the third monitoring and control unit may monitor whether
5 a power state, a sensor state, and states of peripheral devices as environments in which the second monitoring and control unit is operable are normal.

In the present invention, the method for controlling the safety
10 mode of the dual clutch transmission may further include steps of: allowing a monitoring unit to monitor a state of the control unit; and allowing the monitoring unit to determine that an error occurs in the control unit itself when a previously designated signal is not output from the control unit and cut off all power
15 applied to the driving unit through the power control unit.

In the present invention, the driving unit may include an inverter unit for driving the motor in three phases when the actuator for a corresponding gear shift of the dual clutch transmission is a
20 motor, and the method may further include the steps of: allowing the second monitoring and control unit to detect an operation signal of the inverter unit and to compare whether the detected operation signal of the inverter unit is an operation signal corresponding to a shift instruction actually instructed by the
25 first monitoring and control unit; and allowing the second monitoring and control unit to selectively cut off the power of the corresponding gear performing an operation that does not correspond to the shift instruction or the motor control unit of the corresponding gear side.

30

ADVANTAGEOUS EFFECTS

According to an aspect of the present invention, the present invention may detect the malfunctions in the gears or the clutches
35 in the dual clutch transmission and convert the vehicle into the safe state, thereby protecting the vehicle and the driver from accidents.

DESCRIPTION OF DRAWINGS

FIG. 1 is a schematic view of an apparatus for controlling a safety mode of a dual clutch transmission according to a first embodiment
5 of the present invention.

FIG. 2 is a flowchart for explaining a method for controlling the safety mode of the dual clutch transmission in FIG. 1 according to the first embodiment of the present invention.

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FIG. 3 is a schematic view of an apparatus for controlling a safety mode of a dual clutch transmission according to a second embodiment of the present invention.

15 FIG. 4 is a flowchart for explaining a method for controlling the safety mode of the dual clutch transmission in FIG. 3 according to the second embodiment of the present invention.

MODE FOR CARRYING OUT THE INVENTION

20

Hereinafter, an apparatus and method for controlling a safety mode of a dual clutch transmission according to the present invention will be described with reference to the accompanying drawings.

25

In this process, thicknesses of lines and sizes of components illustrated in the drawings may be exaggerated for clarity and convenience of explanation. Also, the terms described below are defined in consideration of functions of the present invention.

30 Thus, definitions of the terms should be made based on the contents throughout this specification.

FIG. 1 is a schematic view of an apparatus for controlling a safety mode of a dual clutch transmission according to a first embodiment
35 of the present invention.

As illustrated in FIG. 1, an apparatus for controlling a safety mode of a dual clutch transmission includes a control unit (110),

a monitoring unit (120), a power control unit (130), and a driving unit (140).

5 The driving unit (140) drives an actuator (151, 152) (for example: a clutch 1 motor and a clutch 2 motor) of the transmission.

10 The control unit (110) includes a first monitoring and control unit (111), a second monitoring and control unit (112), and a third monitoring and control unit (113).

The first monitoring and control unit (111) processes a function related to a shift.

15 For example, the first monitoring and control unit (111) receives an instruction (e.g., a control signal) related to the shift to interrupt (for example, interrupt an odd-numbered gear by a first clutch and interrupt an even-numbered gear by a second clutch) a corresponding gear with a gear shift level and shift feeling indicated by the control signal through an internal function
20 (e.g., a function for processing a function related to the shift). Here, the first monitoring and control unit (111) outputs a control signal (HIZ) to the actuator (for example, a motor, a solenoid, and the like) to control the gear according to the gear shift level and the shift feeling.

25 Here, the first monitoring and control unit (111) operates on performance of the shifting function rather than the safety function and therefore operates in a preset safety mode (e.g., a mode in which all power applied to the driving unit (140) is
30 cut off to prevent rapid acceleration or sudden unintended acceleration) only when a basic circuit error occurs.

That is to say, the first monitoring and control unit (111) may not monitor an error that occurs in itself and thus may not
35 appropriately respond to such an error (an error of the first monitoring and control unit itself).

The second monitoring and control unit (112) monitors an error (a malfunction) of the first monitoring and control unit (111),

checks a corresponding gear (for example: the odd-numbered gear and the even-numbered gear) having the error when the error (the malfunction) is detected, and selectively cuts off the power applied to the corresponding gear side or a motor control unit
5 of a corresponding gear side.

The second monitoring and control unit (112) checks (or detects) signals (signals previously designated for controlling the corresponding gear) input to and output from the first monitoring
10 and control unit (111) to determine the corresponding gear (for example, the odd-numbered gear and even-numbered gear) having the error.

Here, since the erroneous signals do not always cause dangerous
15 situations (for example, rapid acceleration, sudden unintended acceleration, etc.) and may only proceed with a very limited risk situation (for example, rapid acceleration or sudden unintended acceleration, etc.), it is not necessary to cut off (for example, turn off a power stage) all the power applied to the driving unit
20 (140).

This is because, when all the power applied to the driving unit (140) is cut off (i.e., the power stage is turned off), power transmission from the engine is interrupted, and the vehicle may
25 not move at all, causing an accident.

Thus, in this embodiment, the second monitoring and control unit (112) checks the corresponding gear (for example, the odd-numbered gear and the even-numbered gear) having the error
30 and controls the power applied to the gear side or the motor control unit of the corresponding gear side so as to be selectively cut off. As described above, since the power applied to the corresponding gear having the error is selectively cut off, the vehicle may be driven by using only the other gear (for
35 example, the odd-numbered gear and the even-numbered gear) to which the power is not cut off so as to travel to the workshop.

Here, the second monitoring and control unit (112) may control the power control unit (130) connected to the control unit (110)

to selectively cut off the power only to the corresponding gear (for example, the odd-numbered gear and the even-numbered gear) or may control only the corresponding gear (for example, the odd-numbered gear and the even-numbered gear) through the first
5 monitoring and controlling unit (111).

The third monitoring and control unit (113) monitors whether the environment in which the second monitoring and control unit (112) is operable normally (for example, a power state, a sensor state,
10 states of peripheral devices, etc.) is normal, if there is an abnormality, all the power applied to the driving unit (140) is cut off (i.e., the power stage is turned off).

The monitoring unit (120) monitors a status of the control unit
15 (110).

For example, it is determined that an error occurs in the control unit (110) itself when a previously designated signal is not output from the control unit (110). That is, it is determined that
20 all of the internal functions (e.g., the first, second, and third monitoring and control units) of the control unit (110) are in a malfunction state.

As described above, when it is determined that an error occurs
25 in the controller (110) itself, the monitoring unit (120) outputs a signal to cut off all the power applied to the driving unit (140) (i.e., the power stage is turned off).

The power control unit (130) is configured to cut off (i.e. the
30 power stage is turned off) all the power applied to the driving unit (140) when a signal related to the power control is input to either the controller (110) or the monitoring unit (120). Alternatively, the power control unit (130) may selectively cut off the power applied to the motor control unit (141 or 142) of
35 the corresponding gear (for example, the odd-numbered gear and the even-numbered gear) or the motor control unit of the corresponding gear side.

The driving unit (140) receives an instruction (for example, a control signal) related to the shift from the first monitoring and control unit (111) to drive the corresponding gear (for example, driving the odd-numbered gear by the first clutch and driving the even-numbered gears by the second clutch).

In this embodiment, since the actuators for gear shifting are motors (e.g., BLDC motors) (151, 152), the driving unit (140) includes inverter units (142, 145) for driving the motors (151, 152) in three phases and motor control units (141, 144) for controlling switching of the inverter units (142, 145).

Here, when the driving power is not applied through a power terminal (V_PS) of each of the motor control units (141, 144), the corresponding clutch (for example, a clutch 1 and a clutch 2) is not driven. Thus, according to the situation (i.e., the erroneous state), dangerous events (rapid acceleration, sudden unintended acceleration, and the like) do not occur by preventing only one clutch from being driven or by preventing all clutches (for example, the clutch 1 and the clutch 2) from being driven.

Hereinafter, an operation of the second monitoring and control unit (112) will be described in more detail with reference to the flowchart of FIG. 2.

FIG. 2 is a flowchart for explaining a method for controlling the safety mode of the dual clutch transmission in FIG. 1 according to the first embodiment of the present invention.

As illustrated in FIG. 2, the second monitoring and control unit (112) monitors whether the first monitoring and control unit (111) generates an error (S101).

When an error (a malfunction) of the first monitoring and control unit (111) is detected (an example of S102), the corresponding gear (for example, the odd-numbered gear or the even-numbered gear) is determined according to the monitored results (S103).

For example, the second monitoring and control unit (112) checks (or detects) signals (signals previously designated for controlling the corresponding gear) input to and output from the first monitoring and control unit (111) to determine the
5 corresponding gear (for example, the odd-numbered gear and even-numbered gear) having the error.

As the determined results (S103), when an error occurs in the even-numbered gear (i.e., an error occurs in a function of
10 controlling the even-numbered gear) (YES of S104), the second monitoring and control unit (112) selectively cuts off the power applied to the corresponding gear (for example, the even-numbered gear) side having the error or the motor control unit of the corresponding gear side (S105).

15 As the determined results (S103), when an error occurs in the odd-numbered gear (i.e., an error occurs in a function of controlling the odd-numbered gear) (NO of S104), the second monitoring and control unit (112) selectively cuts off the power
20 applied to the corresponding gear (for example, the odd-numbered gear) side having the error or the motor control unit of the corresponding gear side (S106).

FIG. 3 is a schematic view of an apparatus for controlling a safety
25 mode of a dual clutch transmission according to a second embodiment of the present invention.

The configuration of the apparatus for controlling the safety mode of the dual clutch transmission illustrated in FIG. 3 is not
30 greatly different from that illustrated in FIG. 1, but greatly different in that the control unit (110) receives a clutch driving detection signal in each of the inverter parts (142, 145) to check whether an actual operation occurs.

35 For example, when it is assumed that the control unit operates a clutch 1 motor (151) through a clutch 1 motor control unit (141), the first inverter unit (142) outputs a corresponding operation signal if the first inverter unit (142) operates normally. Here, the control unit (110) (more specifically, the second monitoring

and control unit (112) in the control unit) receives an operation signal as a clutch 1 driving detection signal. Whether the first inverter unit (142) normally operates in response to the instruction is checked from the clutch 1 driving detection signal.

5

Similarly, when it is assumed that the control unit operates a clutch 2 motor (152) through a clutch 2 motor control unit (144), the second inverter unit (145) outputs a corresponding operation signal if the first inverter unit (142) operates normally. Here, the control unit (110) (more specifically, the second monitoring and control unit (112) in the control unit) receives an operation signal as a clutch 2 driving detection signal. Whether the second inverter unit (145) normally operates in response to the instruction is checked from the clutch 2 driving detection signal.

10
15

As to the checked results, when an error is detected in the inverter units (142, 145) of the driving unit (140), the second monitoring and control unit (112) may selectively cut off the power applied to the motor control unit (141 or 142) of the corresponding gear (for example, the odd-numbered gear or the even-numbered gear) having the error or the motor control unit of the corresponding gear side.

20

Hereinafter, an operation of the second monitoring and control unit (112) will be described in more detail with reference to the flowchart of FIG. 4.

25

FIG. 4 is a flowchart for explaining a method for controlling the safety mode of the dual clutch transmission in FIG. 3 according to the second embodiment of the present invention.

30

As illustrated in FIG. 4, the second monitoring and control unit (112) detects an operation signal at the corresponding inverter units (142, 145) of the odd-numbered gear and the even-numbered gear of the driving unit (140) (S201).

35

Also, the second monitoring and control unit (112) compares the detected operation signals of the inverter units (142, 145) with

actual instructions (a shift instruction actually instructed by the first monitoring and control unit) (S202).

5 According to the comparison (S202) results, when the operation signals of the sensed inverter units (142, 145) do not correspond to the actual instructions (the shift instructions actually instructed by the first monitoring and control unit) (NO of S202), the second monitoring and control unit (112) determines a
10 corresponding gear (for example, the odd-numbered gear or the even-numbered gear) that has an error (that is, an operation that does not correspond to the actual instruction is performed) (S203).

15 As the determined results (S203), when an error occurs in the even-numbered gear (i.e., an error occurs in a function of controlling the even-numbered gear) (YES of S204), the second monitoring and control unit (112) selectively cuts off the power applied to the corresponding gear (for example, the even-numbered gear) side having the error or the motor control unit of the
20 corresponding gear side (S205).

As the determined results (S203), when an error occurs in the odd-numbered gear (i.e., an error occurs in a function of controlling the odd-numbered gear) (NO of S204), the second
25 monitoring and control unit (112) selectively cuts off the power applied to the corresponding gear (for example, the odd-numbered gear) side having the error or the motor control unit of the corresponding gear side (S206).

30 As described above, the present embodiment has the effect of protecting the vehicle and the driver from accidents by detecting whether the malfunction has occurred in the gear or clutch in the dual clutch transmission and converting the vehicle into the safe state.

35

While the present invention has been particularly shown and described with reference to exemplary embodiments thereof, it will be understood by those of ordinary skill in the art that various changes in form and details may be made therein without

departing from the spirit and scope of the invention as defined by the appended claims. Therefore, the technical protection scope of the present invention should be defined by the following claims.

5

DESCRIPTION OF SYMBOLS

110: Control unit

111: First monitoring and control unit

10

112: Second monitoring and control unit

113: Third monitoring and control unit

120: Monitoring unit

15

130: Power control unit

140: Driving unit

141, 144: Monitor control unit

20

142, 145: Inverter units

151, 152: Motors

PATENT CLAIMS

1. An apparatus for controlling a safety mode of a dual clutch transmission, characterized by comprising:

5 a control unit comprising a first monitoring and control unit processing a function related to a shift to interrupt a corresponding gear of a dual clutch transmission, a second monitoring and control unit checking signals input into and output
10 from the first monitoring and control unit to determine an erroneous corresponding gear of the dual clutch transmission and cut off power or a motor control unit of a corresponding gear side, and a third monitoring and control unit monitoring whether an environment in which the second monitoring and control unit
15 operates is normal to selectively cut off power of a corresponding gear or the motor control unit of a corresponding gear side if there is an abnormality;

a power control unit driven by a control signal for selectively
20 cutting off the power of the corresponding gear, which is output from the control unit, and the motor control unit of the corresponding gear side to cut off power applied to the motor control unit of a driving unit that drives the dual clutch transmission; and

25 a driving unit driving an actuator that interrupts the corresponding gear with a gear shift level and shift feeling according to the control of the control unit.

30 2. The apparatus for controlling the safety mode of the dual clutch transmission of claim 1, wherein

The dual clutch transmission comprises an even-numbered gear and an odd-numbered gear, and

35 the second monitoring and control unit

checks the erroneous corresponding gear of the even-numbered gear and the odd-numbered gear when an error of the first monitoring

and control unit is detected to selectively cut off the power applied to the corresponding gear side or the motor control unit of the corresponding gear side.

5 3. The apparatus for controlling the safety mode of the dual clutch transmission of claim 1, wherein the third monitoring and control unit

monitors whether a power state, a sensor state, and states of
10 peripheral devices as environments in which the second monitoring and control unit is operable are normal.

4. The apparatus for controlling the safety mode of the dual clutch transmission of claim 1, further comprising
15 a monitoring unit monitoring a state of the control unit,

wherein, when a previously designated signal is not output from the control unit, it is determined that an error occurs in the
20 control unit itself to allow the monitoring unit to cut off all power applied to the driving unit through the power control unit.

5. The apparatus for controlling the safety mode of the dual clutch transmission of claim 1, wherein the driving unit
25 comprises

an inverter unit for driving the motor in three phases when the actuator for a corresponding gear shift of the dual clutch transmission is a motor,
30

the second monitoring and control unit detects an operation signal of the inverter unit to compare whether the detected operation signal of the inverter unit is an operation signal corresponding to a shift instruction actually instructed by the
35 first monitoring and control unit, and

when the detected operation signal of the inverter unit does not correspond to the operation signal corresponding to the actually instructed shift instruction, the power of the corresponding gear

that performs an operation that does not correspond to the shift instruction or the motor control unit of the corresponding gear side is selectively cut off.

5 6. A method for controlling a safety mode of a dual clutch transmission, characterized by comprising steps of:
allowing a first monitoring and control unit to process a function related to a shift of a control unit and to
interrupt a corresponding gear of the dual clutch
10 transmission;

allowing a second monitoring and control unit of the control unit to check signals input into and output from the first monitoring and control unit and to determine the erroneous corresponding
15 gear of the dual clutch transmission and cut off the power or the motor control unit of the corresponding gear side;

allowing a third monitoring and control unit of the control unit to monitor whether environments in which the second monitoring and control unit is operable are normal and to selectively cut
20 off the power of the corresponding gear or the motor control unit of the corresponding gear side if there is an abnormality; and

allowing a power control unit to cut off power applied to the motor control unit of the driving unit that drives the dual clutch transmission through a control signal for selectively cutting off
25 the power of the corresponding gear, which is output from the control unit, or the motor control unit of the corresponding gear side.

30
7. The method for controlling a safety mode of a dual clutch transmission of claim 6, wherein, in the step of allowing the second monitoring and control unit to determine the erroneous corresponding gear of the dual clutch trans-
mission and cut off the power or the motor control unit of
35 the corresponding gear side,

the second monitoring and control unit

checks the erroneous corresponding gear of the even-numbered gear and the odd-numbered gear of the dual clutch transmission when an error of the first monitoring and control unit is detected and to selectively cut off the power applied to the corresponding gear side or the motor control unit of the corresponding gear side.

8. The method for controlling a safety mode of a dual clutch transmission of claim 6, wherein, in the step of allowing the third monitoring and control unit to monitor whether the environment in which the second monitoring and control unit is operable is normal,

the third monitoring and control unit monitors whether a power state, a sensor state, and states of peripheral devices as environments in which the second monitoring and control unit is operable are normal.

9. The method for controlling a safety mode of a dual clutch transmission of claim 6, further comprising steps of:

allowing a monitoring unit to monitor a state of the control unit; and

allowing the monitoring unit to determine that an error occurs in the control unit itself when a previously designated signal is not output from the control unit and cut off all power applied to the driving unit through the power control unit.

10. The method for controlling a safety mode of a dual clutch transmission of claim 6, wherein

the driving unit comprises an inverter unit for driving the motor in three phases when the actuator for a corresponding gear shift of the dual clutch transmission is a motor, and

the method further comprising: allowing the second monitoring and control unit to detect an operation signal of the inverter unit and to compare whether the detected operation signal of the

inverter unit is an operation signal corresponding to a shift instruction actually instructed by the first monitoring and control unit; and

- 5 allowing the second monitoring and control unit to selectively cut off the power of the corresponding gear performing an operation that does not correspond to the shift instruction or the motor control unit of the corresponding gear side.

FIG. 1

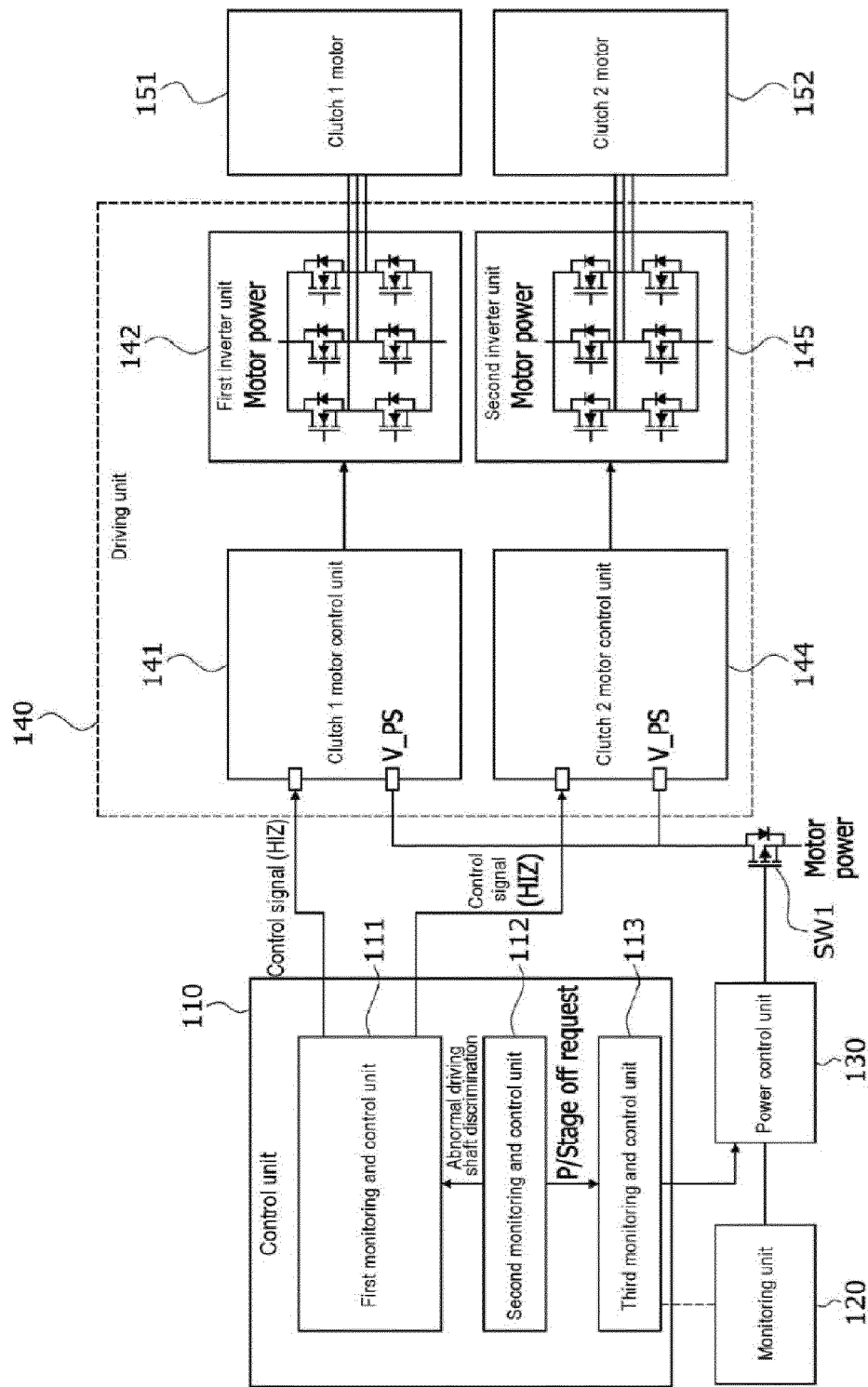


FIG. 2

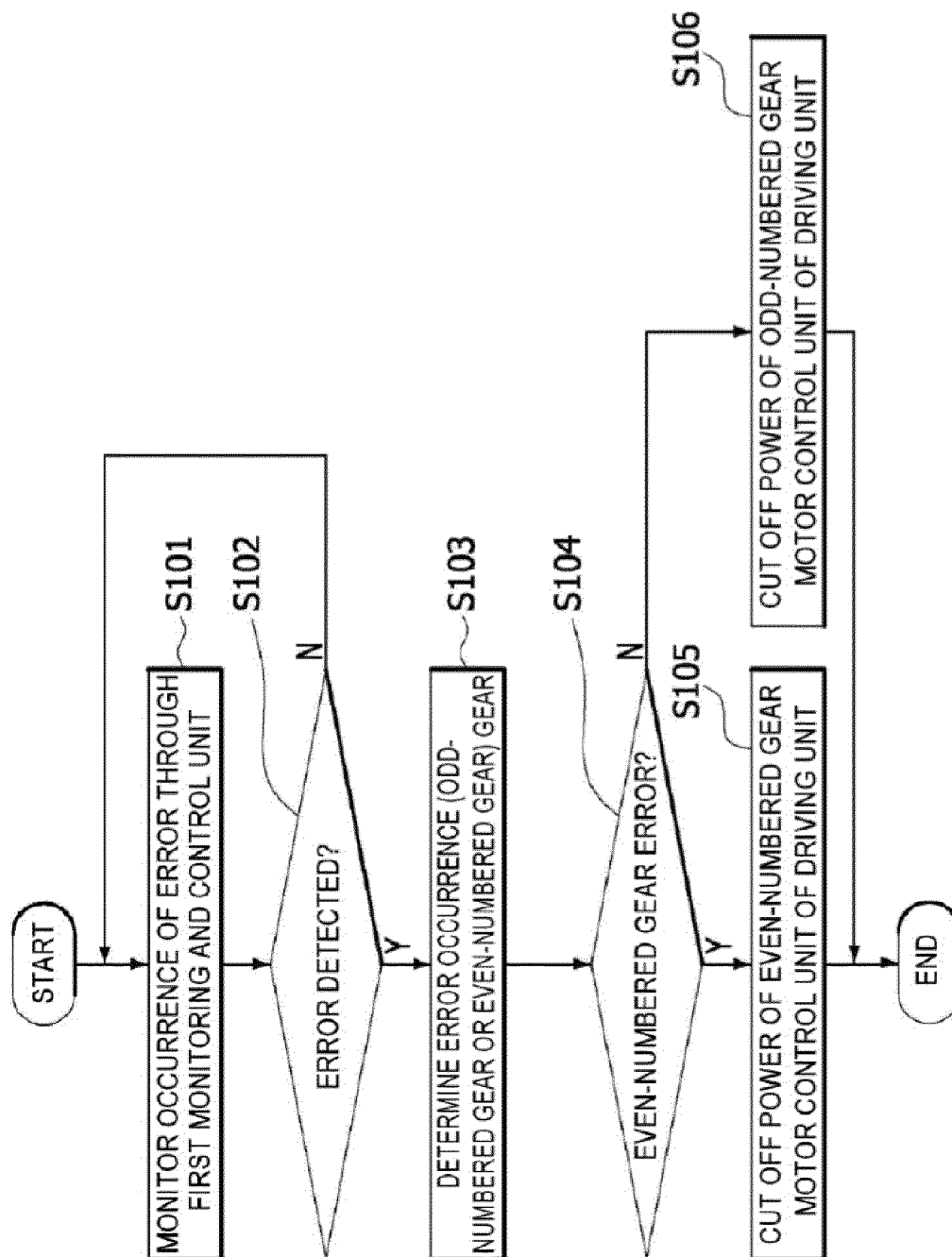


FIG. 3

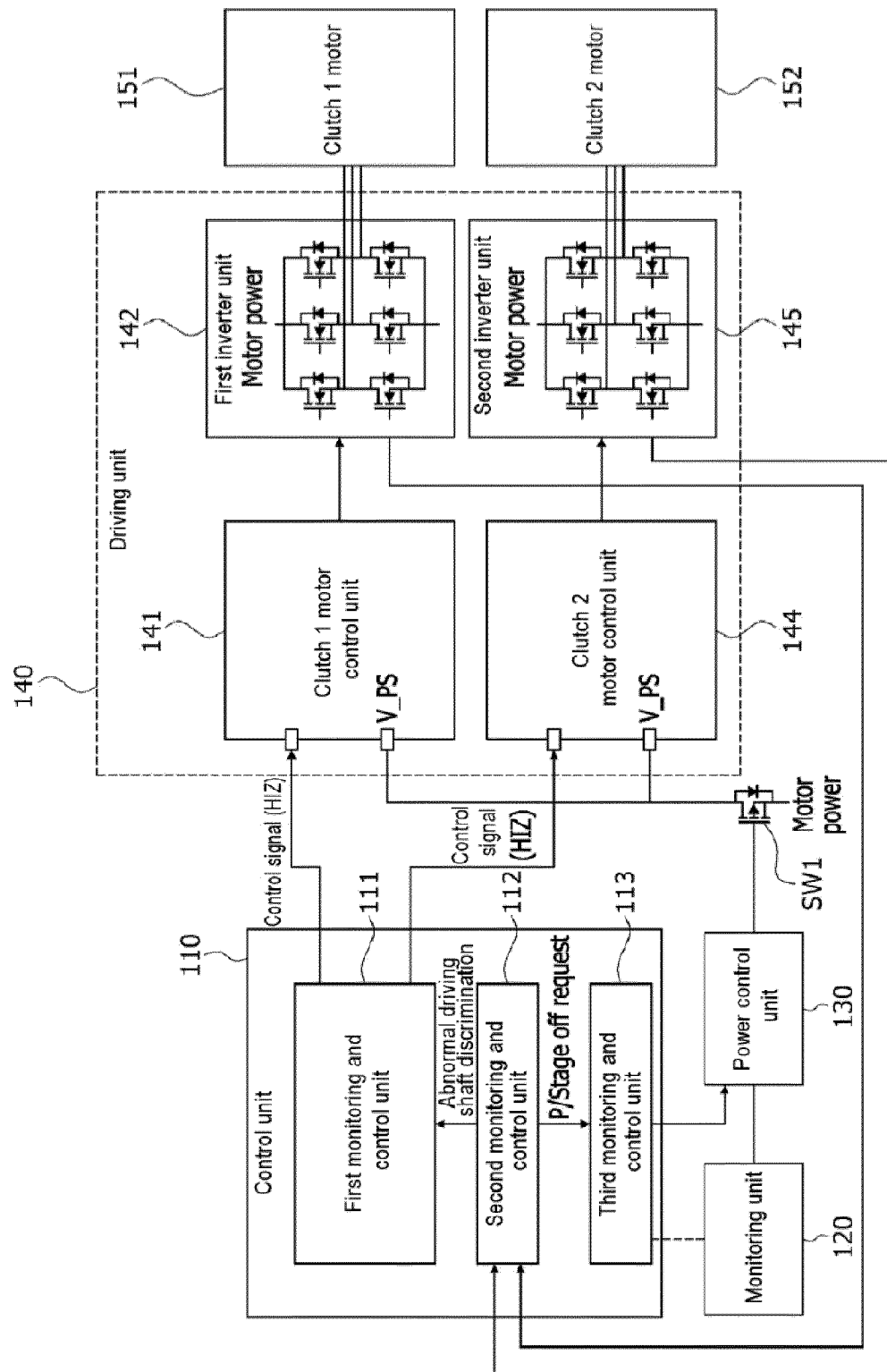
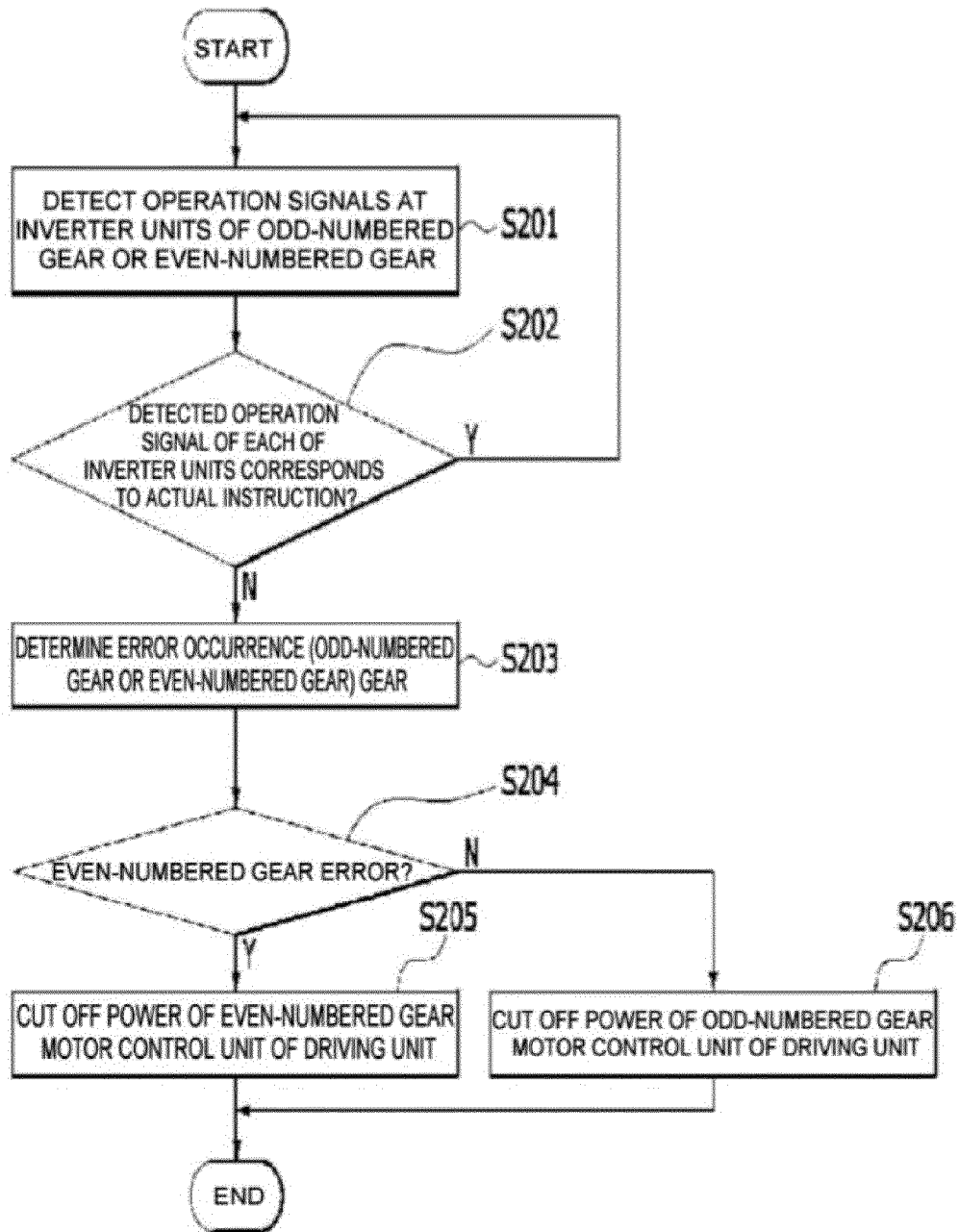


FIG. 4



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2018/061863

A. CLASSIFICATION OF SUBJECT MATTER
INV. F16H61/12 F16H61/688 F16D48/06
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F16H F16D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2014/052326 A1 (SEUFERT MARTIN [DE] ET AL) 20 February 2014 (2014-02-20) abstract; figure 1 paragraphs [0005], [0006], [0007], [0064] - [0080]	1-10
Y	FR 2 978 407 A1 (PEUGEOT CITROEN AUTOMOBILES SA [FR]) 1 February 2013 (2013-02-01) abstract; figure 1 page 1, line 26 - page 3, line 4 page 3, line 24 - page 4, line 11 page 6, line 26 - page 9, line 7 ----- -/--	1-10



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

26 July 2018

Date of mailing of the international search report

07/08/2018

Name and mailing address of the ISA/

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Authorized officer

Daieff, Bertrand

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2018/061863

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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